Subject: **Northeast Wyoming River Basins Plan**
Environmental Uses
Task 2E

Date: March 2002

Prepared by: HKM Engineering Inc.

INTRODUCTION

Environmental uses of water in the Northeast Wyoming River Basins are largely non-consumptive. For instance, instream flows by definition maintain water in the channel to improve habitat. Environmental uses can also be characterized as consumptive. Consider, for instance, wetlands maintenance: surface water spread over a large area increases the amount of surface area evaporative losses.

This memorandum details the water losses associated with environmental uses, including desired reservoir pool levels and release rates, instream bypass requirements made for fisheries and wildlife, local environmental concerns surrounding environmental uses, and where possible, attempts to bracket the optimum stream flows and reservoir levels for environmental use.

INSTREAM FLOWS

Because instream flows can ensure that minimum levels of water are available to environmental uses from the stream rather than being completely appropriated to other uses, they have received much attention in the recent past. Under the 1986 Wyoming statute 41-3-1001 to 1014, the Wyoming legislature codified "instream flows" as a beneficial use of water in the state. The same legislation details how instream flow water rights are filed, evaluated, and ultimately regulated.

The instream flow law change to in-channel use allows instream flow water rights to be filed or granted on unappropriated water originating as natural flow or from storage in existing or new reservoirs, though the water right is held by the State of Wyoming. The use of natural flow sources is defined as the minimum needed to maintain or improve existing fisheries. The use of stored water is defined as the minimum needed to establish or maintain new or existing fisheries.

The law also requires that that Wyoming Game and Fish Commission identify stream segments for instream flow filings and the minimum flows required. The Wyoming Water Development Commission then files the application with the State Engineer's Office in the name of the State of Wyoming.

Wyoming law makes some specific points about instream flows that anyone contemplating an instream flow right must understand:

- No instream flow shall be allowed to interfere with existing water rights, and no instream flow permit shall be issued where the amount thereof would be included as a portion of the consumptive share of the water allocated to the State of Wyoming under interstate compact or United State Supreme Court Decree.

- The amount of water appropriated for instream flow in each river basin in Wyoming shall not result in more water leaving the state than the amount of water that is allocated by interstate compact or United State Supreme Court Decree for downstream uses outside of Wyoming.

- Instream flow waters may be diverted for (other) beneficial consumptive use within one mile upstream from where the instream flow segment crosses the state line, or from where it enters a reservoir that straddles the state line.

A single instream flow permit is on file in the Northeast Wyoming River Basins.

Table 1: Instream Flow Filing, Wyoming Game and Fish Department

Drainage	Tributary	Location	Flow/Timing	Priority
Sand Creek	Redwater Creek	From the south boundary of the SW quarter of the NE quarter, section 7, township 52, range 60 to the north boundary of the SE quarter of the SW quarter, section 5, township 52, range 60 (2.5 miles long).	21 cfs, Nov. 1 – Dec. 31 16 cfs, June 1 – April 30 18 cfs, May 1 – Oct. 31	12/7/1987

The Sand Creek instream flow proposed reservation has been approved and adjudicated by the State Engineer's Office. This instream flow segment is provided in a GIS data theme for the Northeast River Basin as part of this study (Figure 1).

Because environmental concerns are interested in instream flows throughout the state, the number and location of these rights are subject to change. Wyoming Game and Fish Department instream flow supervisor Tom Annear is currently evaluating a number of streams in the state as candidates for instream flow rights.

COAL BED METHANE PRODUCED WATER

All coal bed methane (CBM) activities are dependent on lowering the pressure over the coal seam through reducing the column of water in the coal aquifer. The water produced from these wells is not used consumptively – at least initially. The water is simply transferred from groundwater to surface water status.

Environmental concerns about this water fall into two categories: quantity and quality.

Quantity

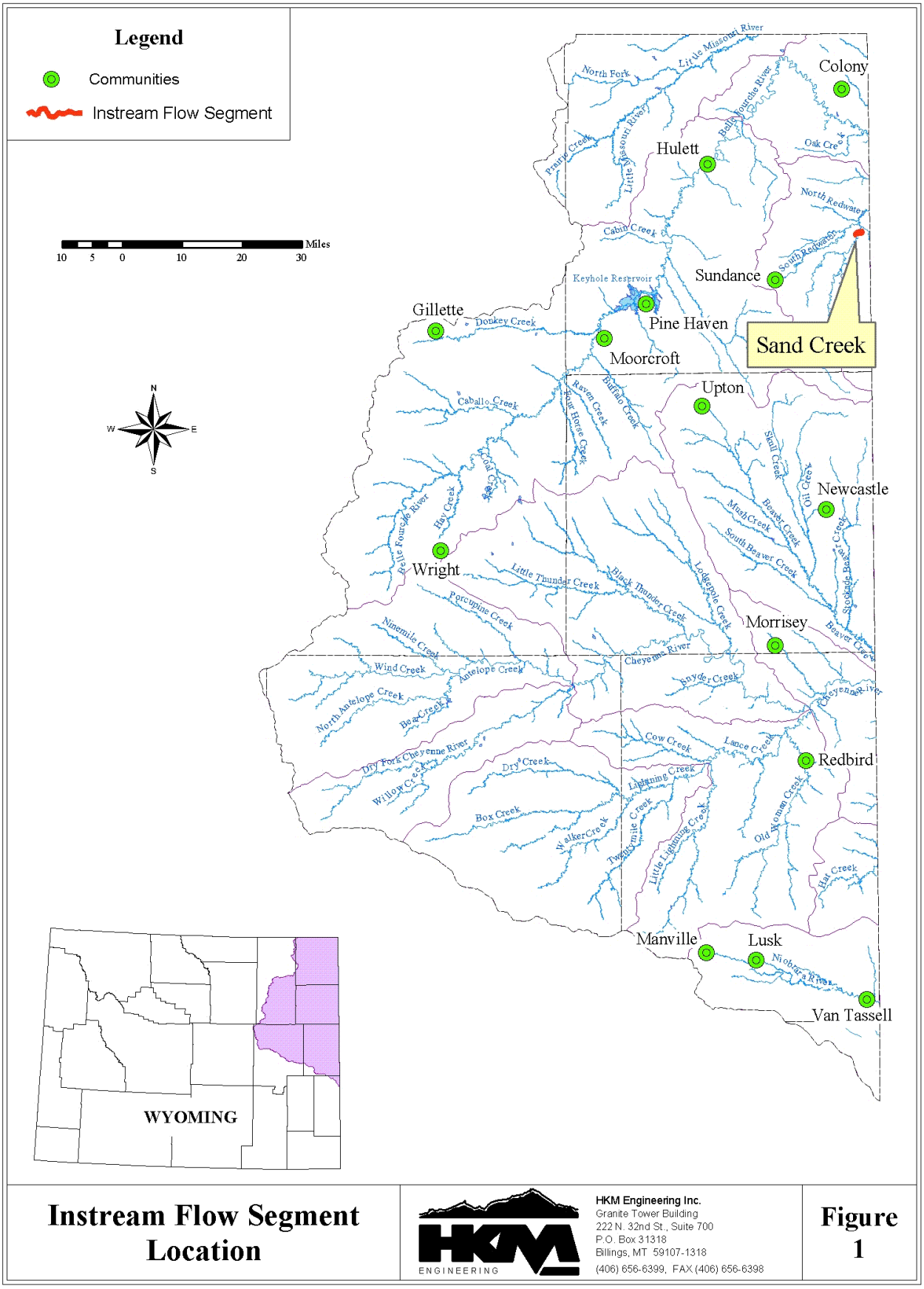
To determine quantity, HKM made an estimate of the produced in the Northeast River Basin based on an analysis of the Oil & Gas Conservation Commission's online data. (See the Industrial Use Memo for more detail on this process.) The estimate shows 5,161 wells producing approximately 35,296 acre-feet in the year 2001 in the basin.

Environmental concerns about this quantity of groundwater now flowing over the surface include increased sedimentation in streams; increased erosion in everything from the draws and gullies collecting the discharges to main-stem rivers downstream; constant presence of water over soils in areas historically watered only in brief episodes; and increased flooding.

Unfortunately, little data are available to substantiate estimates of increased flows as a result of CBM activity. One recent attempt to generate better information on the effects of increased surface water flows yielded a channel width data index. Dr. Greg Wilkerson, a civil engineering professor at the University of Wyoming, notes that the lack of flow data kept him from being able to model flow effects, but that the index produced by the study provides a means of determining how much change has occurred. The index and report are available through the Water Resources Data System at the University of Wyoming.

Quality

A few of the water quality concerns resulting from CBM activity include the interaction of sodium-adsorption ratio (S.A.R.) in the produced water with soils downstream of the discharge; the variable



Instream Flow Segment Location

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Figure 1

nature of potential pollutants like sodium, barium, iron, and manganese in produced waters; the emergence of salt crusts on newly waterlogged clays; and the reaction of organisms (from microinvertebrates to fish to humans) to the produced waters in draws, ponds, or rivers.

The Wyoming Department of Environmental Quality has established a general permit for coal bed methane discharge waters that requires operators to monitor their discharges based on the following tables.

Table 2: WDEQ Water Quality Division Coal Bed Methane General Permit Monitoring Parameters and Limits

Parameter	Limits
Total Petroleum Hydrocarbons	Daily Maximum - 10 mg/l
Specific Conductance	Daily Maximum - 7,500 micromhos/cm
Radium 226	Daily Maximum - 1 pCi/l
pH	6.5 to 8.5 standard units
Total Iron	Daily Maximum - 60 µg/l
Total Manganese	Daily Maximum - 10 µg/l
Total Barium	Daily Maximum - 200 µg/l
Chlorides	Daily Maximum - 46 mg/l

Table 3: WDEQ Water Quality Division Coal Bed Methane General Permit Monitoring Requirements

Parameter	Measurement Frequency	Sample Type
	Once every 6 months	Grab
Specific Conductance	Once every 6 months	Grab
pH	Once every 6 months	Grab
Radium 226	Annually	Grab
Total Flow (Million gallons/day)	Monthly	Continuous
Total Iron	Annually	Grab
Total Manganese	Annually	Grab
Total Barium	Annually	Grab
Chlorides	Annually	Grab

Operators' coverages under the general produced water discharge permit are dependent on staying within the limits above.

Organizations outside the state government have been calling for more information to form the basis for regulation of CBM produced water. For instance, the Coal Bed Methane Coalition in Buffalo, Wyoming, would like to evaluate discharge alternatives. A memorandum distributed in late October 2001 assesses the need for further research on discharge alternatives:

> *Watershed-based water management plans and landowner associations are key to controlling impact and taking maximum advantage of produced water. Alternatives to discharge such as irrigation, storage and retrieval, dust control, and fire suppression all must be tested and evaluated. Consideration must be given to surface water, alluvial underflow, and groundwater. The effects of recharge on alluvium are difficult to study yet very important as alluvial aquifers are important for agriculture. On the obverse of the coin, drawdown issues must be addressed in the deeper aquifers. Means to minimize and mitigate transboundary effects on downstream parties must be identified and implemented where appropriate.*

Further data availability regarding CBM impacts will probably further evolve the debate over regulations and potential mitigations.

WETLANDS MAPPING

Wetlands are transitional lands between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water. For purposes of the classification, wetlands must have one or more of the following three attributes:

1) at least periodically, the land supports predominantly hydrophytes;
2) the substrate is predominantly undrained hydric soil; and
3) the substrate is non-soil and is saturated with water or covered by shallow water at some time during the growing season of each year.

The wetland classification system is hierarchical, with wetlands and deepwater habitats divided among five major systems at the broadest level. The five systems include Marine (open ocean and associated coastline), estuarine (salt marshes and brackish tidal water), Riverine (rivers, creeks, and streams), Lacustrine (lakes and deep ponds), and Palustrine (shallow ponds, marshes, swamps, sloughs). Systems are further subdivided into subsystems, which reflect hydrologic conditions. Below the subsystem is the class, which describes the appearance of the wetland in terms of vegetation or substrate. Each class is further subdivided into subclasses; vegetated subclasses are described in terms of life form and substrate subclasses in terms of composition. The classification system also includes modifiers to describe hydrology (water regime), soils, water chemistry (pH, salinity), and special modifiers relating to man's activities (e.g., impounded, partly drained).

The NWI coverage for the Powder-Tongue River Basin contains 3 systems:

- Riverine: The Riverine System includes all wetlands and deepwater habitats contained within a channel, with two exceptions: (1) wetlands dominated by trees, shrubs, persistent emergents, emergent mosses, or lichens, and (2) habitats with water containing ocean derived salts in excess of 0.5%. A channel is "an open conduit either naturally or artificially created which periodically or continuously contains moving water, or which forms a connecting link between two bodies of standing water" (Langbein and Iseri 1960:5).

- Lacustrine: The Lacustrine System includes wetlands and deepwater habitats with all of the following characteristics: (1) situated in a topographic depression or a dammed river channel; (2) lacking trees, shrubs, persistent emergents, emergent mosses or lichens with greater than 30% areal coverage; and (3) total area exceeds 8 ha (20, acres). Similar wetland and deepwater habitats totaling less than 8 ha are also included in the Lacustrine System if an active wave-formed or bedrock shoreline feature makes up all or part of the boundary, or if the water depth in the deepest part of the basin exceeds 2 m (6.6 feet) at low water. Lacustrine waters maybe tidal or nontidal, but ocean derived salinity is always less than 0.5%.

- Palustrine: The Palustrine System includes all nontidal wetlands dominated by trees, shrubs, persistent emergents, emergent mosses or lichens, and all such wetlands that occur in tidal areas where salinity due to ocean-derived, salts is below 0.5%. It also includes wetlands lacking such vegetation, but with all of the following four characteristics: (I) area less than 8 ha (20 acres); (2) active wave-formed or bedrock shoreline features lacking; (3) water depth in the deepest part of basin less than 2 m at low water; and (4) salinity due to ocean-derived salts less than 0.5%.

The three systems are divided into six- subsystems:

- Riverine/Lower Perennial: The gradient is low arid water velocity is slow There is no tidal influence, and some water flows throughout the year. The substrate consists mainly of sand and mud. Oxygen deficits may sometimes occur, the fauna is composed mostly of species that reach their maximum

abundance in still water; and true planktonic organisms are common. The gradient is lower than that of the Upper Perennial Subsystem and the floodplain is well developed.

- Riverine/Upper Perennial: The gradient is high and velocity of the water fast. There is no tidal influence and some water flows throughout the year. The substrate consists of rock, cobbles, or gravel with occasional patches of sand. The natural dissolved oxygen concentration is normally near saturation. The fauna is characteristic of running water, and there are few or no planktonic forms. The gradient is high compared with that of the Lower Perennial Subsystem, and there is very little floodplain development.

- Riverine/Intermittent: In this Subsystem, the channel contains flowing water for only part of the year. When the water is not flowing, it may remain in isolated pools or surface water may be absent. Classes. Rock Bottom, Unconsolidated Bottom, Aquatic Bed, Streambed, Rocky Shore, Unconsolidated Shore, and Emergent Wetland (nonpersistent).

- Lacustrine/Limnetic: All deepwater habitats within the Lacustrine System, many small Lacustrine Systems have no Limnetic Subsystem.

- Lacustrine/Littoral: All wetland habitats in the Lacustrine System.

- Palustrine: (see above definition).

The subsystems are further divided into classes. The classes describe the general appearance of the habitat in terms of either the dominant life form of the vegetation or the physiography and composition of the substrate-features that can be recognized without the aid of detailed environmental measurements. The following list identifies and defines the NWI classes in the Powder-Tongue River Basin:

- Unconsolidated Bottom: Characterized by the lack of large stable surfaces for plant and animal attachment. They are usually found in areas with lower energy than Rock Bottoms, and may be very unstable. Exposure to wave and current action, temperature, salinity, and light penetration determines the composition and distribution of organisms.

- Streambed: In most cases streambeds are not vegetated because of the scouring effect of moving water, however, they may be colonized by “pioneering” annuals or perennials during periods of low flow or they may have perennial emergents and shrubs that are too scattered to qualify, the area for classification as Emergent Wetland or Scrub-Shrub Wetland.

- Aquatic Bed: Represent a diverse group of plant communities that requires surface water for optimum growth and reproduction. They are best developed in relatively permanent water or under conditions of repeated flooding. The plants are either attached to the substrate or float freely in the water above the bottom or on the surface.

- Unconsolidated Shore: Characterized by substrates lacking vegetation except for pioneering plants that become established during brief periods when growing conditions are favorable. Erosion and deposition by waves and currents produce a number of landforms such as beaches, bars, and flats, all of which are included in this class.

- Emergent: In areas with relatively stable climatic conditions, Emergent Wetlands maintain the same appearance year after year. In other areas, such as the prairies of the central United States, violent climatic fluctuations cause them to revert to an open water phase in some years. Emergent Wetlands are known by many names, including marsh, meadow, fen, prairie pothole, and slough,.

- Open Water/Unknown Bottom: Areas of open water such as stock ponds, small lakes, or small ponds.

- Scrub-Shrub: Dominated by woody vegetation less than 6 m (20 feet) tall. The species include true shrubs, young trees, and trees or shrubs that are small or stunted because of environmental conditions.

- Forested: Characterized by woody vegetation that is 6 m tall or taller. They are common in the eastern United States and in those sections of the West where moisture is relatively abundant, particularly along rivers and in the mountains.

The National Wetlands Inventory (NWI) of the U.S. Fish and Wildlife Service produces information on the characteristics, extent, and status of the Nation's wetlands and deepwater habitats. Federal, state, and local agencies, academic institutions, the U.S. Congress, and the private sector use this information. The Emergency Wetland Resources Act of 1986 directs the service to map the wetlands of the United States. The NWI has mapped 89% of the lower 48 states, and 31% of Alaska. The act also requires the service to produce a digital wetlands database for the United States. About 39% of the lower 48 states and 11% of Alaska are digitized. Congressional mandates require the NWI to produce status and trends reports to Congress at 10-year intervals.

The U.S. Army Corps of Engineers (Corps) administers the Section 404 program governing the discharge of dredge and fill material into waters of the U.S. as defined and guided by Section 404 of the Clean Water Act. The wetlands that fall within the Section 404 regulation are referred to as jurisdictional wetlands. The indicators of wetlands suggested by the Corps in their *1987 Manual for Delineation of Wetlands*, are used as the basis for determining the presence of a wetland by most scientists and engineers. Other, broader, definitions of wetlands are generally used in addition to, or in place of, the Corps guidelines when the ecological aspects of wetlands are the focus. The U.S. Fish and Wildlife Service scientists and many other scientists, land use planners, and watershed or water quality managers, utilize the Cowardin system for more in-depth identification or classification of wetlands. The NWI's mapping corresponds with the Cowardin system.

In 1982, the NWI produced the first comprehensive and statistically valid estimate of the status of the Nation's wetlands and wetland losses, and in 1990 produced the first update. Future national updates were scheduled for 2000, 2010, and 2020. The status of the 2000 review is not known.

The Wyoming Spatial Data and Visualization Center downloaded the digital line graphs (dlg) from the NWI web page and converted the dlg data to Arc/Info vector coverages with matching attributes. Vector coverages include both line (riverine) and polygon (lacustrine and palustrine) wetland features.

The wetlands mapping in the Northeast River Basin is provided as a GIS data theme for this study (Figure 2).

MINIMUM RESERVOIR CONSERVATION POOLS AND BYPASS REQUIREMENTS

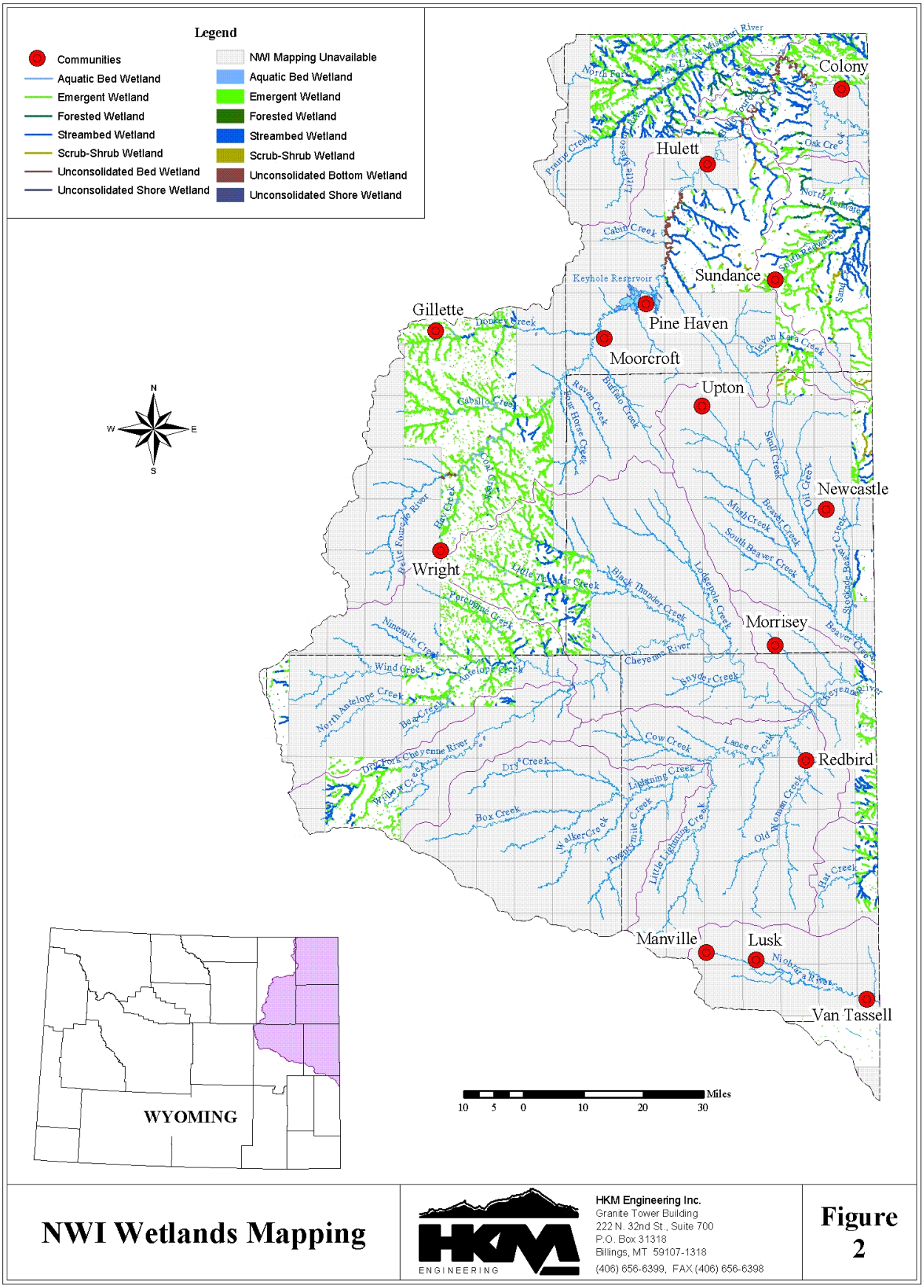
In general, conservation pools are intended to provide the minimum volume of water necessary to maintain the existing aquatic life in the reservoir. Because on-stream reservoirs disrupt the natural flow in a stream, minimum bypass requirements are often dictated during the permitting process to provide the minimum flow downstream required to maintain existing fisheries.

Minimum conservation pools and minimum flow releases are not available or are nonexistent for the reservoirs of the Northeast Wyoming River Basins. This is not to say they aren't an issue; the low water levels in Keyhole Reservoir in the 1990s brought the issue to a boil. Low levels affected the fisheries and made boating on the reservoir unsafe. Some Wyoming residents considered reexamining the Belle Fourche Compact with South Dakota to impose a minimum pool level in the reservoir. Better water years followed before any such attempt was made, and the issue has lain dormant since.

COMMENTS AND CONCERNS

In soliciting comments and concerns on environmental issues in this basin, HKM personnel queried groups with environmental concerns in the basin with the following questions:

- What are the basic environmental demands/uses in the Northeast Wyoming River Basins at present?
- How have those changed in the past few decades?



NWI Wetlands Mapping

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Figure 2

- How are they likely to change in the next 30 years?

Not every group responded. As a result, this memo doesn't attempt to provide a compendium of all environmental concerns in the basin – only those provided in response to e-mailed, telephoned, or mailed queries.

Group: **Wyoming Game and Fish Department**
Contact: *Bob McDowell, Regional Fisheries Supervisor*

Many of McDowell's environmental concerns spring naturally from his work with freshwater fisheries in the basin and have been developed and explained in his agency's Fishery Management Plans.

- Coal Bed Methane produced water
  - potential for erosion/sedimentation
  - impact of CBM withdrawals on springs supplying certain fisheries
- Powder River instream flows
  - Kendrick Reservoir impedes migration of native species
    - Looking into the possibility of a bypass channel
  - No instream flow reservations for many reaches harboring native species
  - Powder represents one of very few free-flowing prairie streams
- Irrigation
  - Irrigation diversions as impediments to migration
  - Reaches dewatered downstream of transbasin diversions
  - Fish kills when irrigation diversions shut down
  - Prairie Dog Creek erosion and channel straightening
  - Water quality impacts of return flows from irrigation
- Native fish species management/recovery
  - Sturgeon Chub
  - Yellowstone Cutthroat
- Reservoir fisheries
  - DeSmet, Twin Lakes, Tie Hack best when level fluctuations are minimized
- Riparian zones
  - Recognition of the importance of the cooling, cover, etc. these zones provide
  - Land management the greatest challenge
- Pipeline-stream crossings
  - What is the accumulated impact of crossings on a stream's hydrology, water quality, fisheries?

NOTE: The Wyoming Game and Fish Department has maintained a stream classification map ranking free-flowing surface waters based on their trout biomass, accessibility, and aesthetics. Because users became confused about the function of this map, the department no longer supports it (Stewart, 3 Dec. 2002).

Group: **Wyoming Natural Diversity Database**
Contact: *George Jones, Natural Heritage Ecologist*

Jones is concerned that the riparian woodlands along the Cheyenne be maintained. The Cheyenne River supports extensive cottonwood stands because flow regimes have been altered little in the past. Other rivers, like the Little Missouri, have some existing riparian woodlands, but Jones maintains that the Cheyenne has the greatest stands in this basin. These stands are coincident with a complete native fish fauna.

These stands of cottonwoods demand flooding and new sediment bars to re-seed and re-establish, and Jones would like to ensure that the natural flow regime of the Cheyenne is maintained in the future.

Group: **Nature Conservancy**
Contact: *Sally Morton, staff member*

The Nature Conservancy has an established goal of "the long-term survival of all viable native species and community types through the design and conservation of portfolios of sites within ecoregions," (TNC, p.2). To that end, the organization produced a guide for its efforts in the "Northern Great Plains Steppe" (an area encompassing parts of Alberta and Saskatchewan, Canada, Wyoming, Montana, North and South Dakota, and Nebraska) in a 1999 document, *Ecoregional Planning in the Northern Great Plains Steppe.* There, the organization rates the relative urgency of its efforts in the geographic areas in the steppe and the species at stake.

Area	***Species/Eco-Type***
Cheyenne River Riparian	Cottonwood stands
Hat Creek	Alpine fever-few Toadstool Badlands
Upper Niobrara River	Ute's ladies' tresses Riparian community

In one way or another, all of these listings are concerned with water in the Northeast Wyoming River Basins, and as George Jones, a contributor to the Nature Conservancy's study (see separate listing under Wyoming Natural Diversity Database), stated, much of this concern stems from an interest in ensuring that the current, near-virgin flow regimes of the tributaries of the Cheyenne are maintained.

Group: **Wyoming Outdoor Council**
Contact: *Dan Heilig*, executive director

Heilig's primary concern was that wetlands and riparian habitats have no appropriation under Wyoming water law at present. He would like to see these areas protected with allocations of water for their consumptive use under Wyoming law.

Heilig's group would also like to see some of the produced water from oil and gas activities in the basin augment streamflows to maintain habitat, though the variability in water quality from wells is a concern.

Group: **Powder River Basin Resource Council**
Contact: *Judy McCullough, member, and Kevin Lind, director*

Judy McCullough submitted comments focusing on concerns over the stability of Keyhole Dam when it is kept full, coal-bed methane produced water's sodium absorption ratio and pollutants, and a general mistrust of CBM operators when maintenance of water quality and quantity may be in their hands.

Group: **Ducks Unlimited**
Contact: Barry Floyd, Wyoming state staff, and Jon Roaldson, regional biologist

Ducks Unlimited (D.U.) has taken an active part in changing how water is used in riparian areas in the Northeast Wyoming River Basins. The organization knows from its research and experience that ducks and other waterfowl need wetlands and open water for breeding, nesting, rearing, feeding and isolation from land-based predators. The Northeast Wyoming River Basins isn't the perfect home for waterfowl, representing as it does the western extreme of the central flyway (Barry Floyd, April 10, 2001). But D.U. has worked with area landowners, the WGFD, various foundations, the USFWS, and the Natural Resource Conservation Service to help clean up waters, rehydrate old oxbows, create impoundments, and generally create new wetlands wherever possible.

The group is interested in the Northeastern Wyoming River Basin for its status as a secondary, pothole terrain for waterfowl. D.U. considers the area a priority for long-range planning. In addition to its natural amenities for ducks, the Northeast Wyoming River Basins doesn't have the pesticides or predator

pressures that are found in the traditionally more productive plains regions to the east. As a result, the area supports a higher ratio of young per nest than can be found to the east (ibid).

D.U. regional biologist Jon Roaldson notes that the water needs of ducks are straightforward. In general, the best water conditions can be found in littoral zones, where light penetrates to the bottom of the channel or still water. This allows a number of invertebrates to survive that in turn provide waterfowl with the protein they need in breeding and brooding seasons. For everything except diving ducks, the optimal depth is approximately three feet, with anything greater than six feet being excessive (Roaldson, D.U., April 2001).

The Northeast Wyoming River Basins has been pockmarked with glacial or wind-formed palustrine basins that migratory waterfowl consider attractive, according to Roaldson. The shallow, warmer waters of these basins provide good breeding and courtship habitat, but must have seasonal wetlands of heavy brush to support brooding activities.

Many of the dams created to hold coal bed methane discharge water create the shallow basins Roaldson talks about, but they need time to develop proper benthic life or their water quality is not conducive to that life, limiting their productivity for waterfowl.

Group: **Sierra Club**
Contact: Elizabeth Howell, Wyoming staff

The Sierra Club's primary environmental concern relating directly to water in the basin centers on the State of Wyoming's establishment of Total Maximum Daily Loads (TMDLs). These thresholds of pollutant streams can accept and still meet their designated uses are required in the 1972 Clean Water Act.

The Wyoming Department of Environmental Quality judged that it didn't have the information to create TMDLs, so in 1990, it surveyed conservation districts, the U.S. Forest Service, the Bureau of Land Management, the Wyoming Game and Fish Department, and others, seeking professional opinions of impairment. The resulting list of impaired streams, called the 303(d) list for Section 303(d) of the Clean Water Act, has been submitted to the U.S. Environmental Protection Agency since then.

The Sierra Club Legal Defense Fund sued the State of Wyoming in Denver Federal Court on December 9, 1996, on behalf of Wyoming Outdoor Council, Biodiversity Associates, and American Wildlands. The groups sought to require Region VIII EPA to implement the TMDL program in Wyoming. The litigants claim that the state has not adequately monitored its streams, has not listed all impaired streams, and has not developed sufficient point or nonpoint source TMDLs.

Since then, the venue for the case has been changed to Casper, the Wyoming DEQ has established a five-year timeframe for monitoring streams on the 1996 303(d) list and a ten-year schedule for adopting TMDLs on those streams with credible data indicating TMDLs need to be established. The 1996 draft list included 336 streams. The revised, 1998 303(d) draft list included

- 14 waterbodies with credible data indicating impairment
- 29 waterbodies which have permits with wasteload allocations due for renewal
- 20 waterbodies with credible nonpoint source threats
- 33 waterbodies with credible data to delist (meeting their beneficial uses)
- 335 waterbodies about which there is insufficient credible data to know whether they should be listed or not. (WYDEQ)

According to the most current information available on the WDEQ web site, Wyoming's 2000 303(d) list has 46 members on Table A (with quality impairments), 13 on Table B (with Waste Load Allocation permits expiring), and 23 on Table C (with threatened water quality). Of these, the Northeast Wyoming River Basins has five on Table A, none on Table B, and one on Table C.

2000 303(d) List Members in the Northeast Wyoming River Basins

2000 303(d) list – Table A, Northeast Wyoming River Basins (Waterbodies with water quality impairments)

Waterbody Name	Location	State Impairment	Priority	Use Impairment/ Threat	Date Listed
Belle Fourche River	Between Arch Creek and Hulett	Fecal Coliform	L	Contact Recreation	1996
Belle Fourche River	From Keyhole Reservoir to an unknown distance above Rush Creek	Fecal Coliform	L	Contact Recreation	1996
Donkey Creek	From confluence with Belle Fourche River to Stonepile Creek	Fecal Coliform	M	Contact Recreation	2000
Gillette Fishing Lake	City of Gillette	Phosphates	L	Warm-Water Fishery	1996
		Siltation	L	Warm-Water Fishery	1996

2000 303(d) list – Table B, Northeast Wyoming River Basins (Waterbodies with Waste Load Allocation discharge permits expiring)

No listings in the Northeast Wyoming River Basins

2000 303(d) list – Table C, Northeast Wyoming River Basins (Waterbodies with water quality threats)

Waterbody Name	Location	State Impairment	Priority	Use Impairment/ Threat	Date Listed
Poison Creek (Cheyenne River)	S16-17, T46N, R63W	Oil Seeps	L	Wildlife/Agriculture	2000

(Wyoming's 2000 305(b) State Water Quality Assessment Report, Appendix B)

Howell is concerned about the sudden reduction in the number of streams on the 303(d) list, about the difficulty in applying the list criteria, the lack of water quality issues stemming from CBM discharges, and that ranching and timber interests might be released from responsibility with the new list.

Group: **U.S. Fish and Wildlife Service**
Contact: Michael Long, Field Supervisor

In a letter, Long expressed his agency's environmental concerns based on the list of threatened or endangered species present in the basin (in accordance with section 7(c) of the Endangered Species Act of 1973.

Table 5: USF&WS Listed and Proposed Species for Threatened and Endangered Status

Species	***Status***	***Expected Occurrence***
Black-footed ferret	Endangered	Potential resident in prairie dog colonies
Canada lynx	Threatened	Resident of forested areas
Bald eagle	Threatened	Nesting, winter resident, migrant
Mountain plover	Proposed	Grasslands statewide
Whooping crane	Experimental	Resident, migrant
Ute ladies' tresses	Threatened	Seasonally moist soils and wet meadows of drainages below 6,500 feet in elevation

Table 6: USF&WS Candidate Species for Threatened and Endangered Status

Species	***Expected Occurrence***
Black-tailed prairie dog	Grasslands generally east of the continental divide
Swift fox	Grasslands statewide
Sturgeon chub	Powder River drainage

OPTIMUM RESERVOIR LEVELS/STREAM FLOWS

Few respondents wanted to answer the question about what reservoir levels or stream flows could maximize environmental use of water in the basin directly. For Ducks Unlimited representatives, proper streamflows should include high, peaked hydrographs to ensure that palustrine areas and riparian areas are often recharged. They would probably also maintain that lakes should be dropped quickly to levels that maximize the area covering water less than six feet deep Conversely, trout enthusiasts would seek to ensure that stream flows were maintained to maximize the dissolved oxygen in streams (rapid, turbulent flow). High flows for extended periods can bring more sediment into suspension, but sudden, high, peaked hydrographs can flush sediments to clean gravel spawning beds. And trout (and other fish) tend to have large winterkill rates in small, shallow lakes (Guenther and Hubert, *Great Basin Naturalist*, p. 282). A method for determining pool minima to maximize the survival and propogation of salmonids in Wyoming has been published (Guenther and Hubert, *Environmental Management*) and provides guidance in determining the optimum operating range in reservoirs for waterfowl and salmonids.

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